

NASA

SECTION 2

- **Chair, Space Shuttle Loads & Dynamics Panel**
- **Mail Code ES2 x38889**

: Madera, Pamela L [mailto:pam.l.madera@usahq.unitedspacealliance.com]

Sent: Monday, January 20, 2003 5:47 PM

To: CURRY, DONALD M. (JSC-ES3) (NASA); ROCHA, ALAN R. (RODNEY) (JSC-ES2) (NASA); LEVY, VINCENT M. (JSC-EG) (NASA); KOWAL, T. J. (JOHN) (JSC-ES3) (NASA); DERRY, STEPHEN M. (STEVE) (JSC-EG3) (NASA)

Cc: 'Scott Christensen V (E-mail)'; 'Norman Ignacio (Nach) (E-mail)'; CHAO, DENNIS; Stoner-1, Michael D; 'Carlos Ortiz (E-mail)'; 'Michael J Dunham (E-mail)'; Sebesta, Stephen P; CORONADO, DIANA; "Craig Madden' (E-mail); Bell, Dan R.; Gordon, Michael P.; Paul A Parker (E-mail)

Subject: STS-107 Debris Analysis Team Plans

The Boeing/USA team would like to meet with you Tuesday at 2:00 on meet-me-line number
to discuss analysis plans for assessing the STS-107 Debris Impact.

Pam Madera

Vehicle and Systems Analysis Subsystem Area Manager

Phone: 281-282-4453

Michele Lewis

From: SCHOMBURG, CALVIN (JSC-EA) (NASA)
Sent: Tuesday, January 21, 2003 10:26 AM
To: SHACK, PAUL E. (JSC-EA42) (NASA); SERIALE-GRUSH, JOYCE M. (JSC-EA) (NASA); HAMILTON, DAVID A. (DAVE) (JSC-EA) (NASA)
Subject: FW: STS-107 Post-Launch Film Review - Day 1



107film1.pdf E212.mpg

FYI-TPS took a hit-should not be a problem-status by end of week.

-----Original Message-----

From: Oliu-1, Armando [mailto:Armando.Oliu-1@nasa.gov]
Sent: Friday, January 17, 2003 6:08 PM
To: Abner, Charlie; ADAMS, RANDALL W. (JSC-MA2) (NASA); 'Ayotte, William'; Blue, John B; BROWN, KENNETH L. (JSC-MV6) (NASA); 'Buckingham, Bruce'; Bulloch-1, Steve; Bursian, Henry; BYRNE, GREGORY J., PHD (JSC-SX) (NASA); Chitko, Pete J.; 'cookjh@thiokol.com'; DERRY, STEPHEN M. (STEVE) (JSC-EG3) (NASA); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); 'Eastwood Martin'; Estrada-1, Carlos; FRICKE, ROBERT W., JR (JSC-MV) (LM); GAETJENS, WILLIAM M. (JSC-CB) (USA); Glenn-1, Malcolm; GOMEZ, REYNALDO J. (RAY) (JSC-EG3) (NASA); 'GRP DOC Mission Support Room'; Guidi-1, John; Hawkins, Tyrell; Herman, Robert S; Herst, Terri; Holloway, Darrell L; 'Holmes Steve'; Huff, Joy N.; 'Jay.Sambamurthi@msfc.nasa.gov'; Jones-1, Frank; Kelley-1, David; 'Khodadoust, Abdollah'; Kienitz, Fred; 'Kinder Gerald'; 'Koenig Lisa'; 'Kopfinger, Philip A'; Lafleur, Tom C; Leggett, Kenneth D; Leinbach-1, Mike; HAM, LINDA J. (JSC-MA2) (NASA); 'Mango, Ed'; 'McClymonds, Jack'; MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA); Mosteller-1, Ted; Mulligan-1, Melanie; Nguyen-1, Bao; 'O'Farrell Mike'; ORTIZ-LONGO, CARLOS R., PHD (JSC-EA4) (NASA); 'Otte Neil'; 'Otto, Scott'; 'Page, Robert'; Payne-1, Michael; 'Ramirez, Juan'; Revay, Kenneth P; 'Rieckhoff, Tom - PC'; 'Rieckhoff, Tom - UNIX'; ROE, RALPH R. (JSC-MV) (NASA); SCHOMBURG, CALVIN (JSC-EA) (NASA); 'Schricker, B.'; 'snichols@hq.nasa.gov'; Sofge, Al (NASA HQ); 'Speece, Robert'; Stevenson-1, Charlie; 'Stone, Jeff'; Tenbusch-1, Ken; Wells-1, Joel; Wilson, Thomas F.; Rivera, Jorge; Greenwell-1, Shawn; Oliu-1, Armando; Crisafulli, Anthony; Brewer, Raymond J; Marren, Tom; Thompson-1, Becky J.; Key, John; Lorick, Vicky K; Champagne, Lorraine C; Kent, William T. "Tim"; Spaulding-1, Jeff; Altemus-1, Steve; Mullins, Michael B; Powell, Doug; Cross, Donald G; Hammel-1, Donald; Stoner-1, Michael D; Greby, Mark J
Subject: STS-107 Post-Launch Film Review - Day 1

Attached is the Day 1 report and an MPG of Anomaly #1.

<<107film1.pdf>> <<E212.mpg>>

Michele Lewis

From: CAMPBELL, CARLISLE C., JR (JSC-ES2) (NASA)
Sent: Thursday, January 30, 2003 5:38 PM
To: SERIALE-GRUSH, JOYCE M. (JSC-EA) (NASA)
Subject: FW: STS-107 Post-Launch Film Review - Day 1

-----Original Message-----

From: SMITH, JAMES P. (JSC-ES2) (NASA)
Sent: Wednesday, January 22, 2003 7:15 AM
To: DL ES2 Branch; DL ES2 Contractors
Subject: FW: STS-107 Post-Launch Film Review - Day 1

Watch the video first and see if you can spot anything.

-----Original Message-----

From: Pedraza, Michael A [mailto:michael.a.pedraza@usago.ksc.nasa.gov]
Sent: Tuesday, January 21, 2003 8:35 PM
Subject: STS-107 Post-Launch Film Review - Day 1

Michael Pedraza
Storekeeper/Expediter
MSC-44 RPSF
USK-337
Phone 861-6452
Fax 861-0374

(^..^ (*..^..,*..^..,*..^..)*..
``^..^..,*Supply & Support*,^..^..''
(..^..(*..^..,*..^..,*..^..,*..^..)*..^..)



Attached is the Day 1 report and an MPG of Anomaly #1.

Michele Lewis

From: CAMPBELL, CARLISLE C., JR (JSC-ES2) (NASA)
Sent: Thursday, January 30, 2003 5:36 PM
To: SERIALE-GRUSH, JOYCE M. (JSC-EA) (NASA)
Subject: FW: STS-107 Wing Debris Impact on Ascent: Final analysis case completed

-----Original Message-----

From: ROCHA, ALAN R. (RODNEY) (JSC-ES2) (NASA)
Sent: Sunday, January 26, 2003 7:45 PM
To: SHACK, PAUL E. (JSC-EA42) (NASA); MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA); OUELLETTE, FRED A. (JSC-MV6) (NASA)
Cc: ROGERS, JOSEPH E. (JOE) (JSC-ES2) (NASA); GALBREATH, GREGORY F. (GREG) (JSC-ES2) (NASA); JACOBS, JEREMY B. (JSC-ES4) (NASA); SERIALE-GRUSH, JOYCE M. (JSC-EA) (NASA); KRAMER, JULIE A. (JSC-EA4) (NASA); CURRY, DONALD M. (JSC-ES3) (NASA); KOWAL, T. J. (JOHN) (JSC-ES3) (NASA); RICKMAN, STEVEN L. (JSC-ES3) (NASA); SCHOMBURG, CALVIN (JSC-EA) (NASA); CAMPBELL, CARLISLE C., JR (JSC-ES2) (NASA)
Subject: STS-107 Wing Debris Impact on Ascent: Final analysis case completed

As you recall from Friday's briefing to the MER, there remained open work to assess analytically predicted impact damage to the wing underside in the region of the main landing gear door. This area was considered a low probability hit area by the image analysis teams, but they admitted a debris strike here could not be ruled out.

As with the other analyses performed and reported on Friday, this assessment by the Boeing multi-technical discipline engineering teams also employed the system integration's dispersed trajectories followed by serial results from the Crater damage prediction tool, thermal analysis, and stress analysis. It was reviewed and accepted by the ES-DCE (R. Rocha) by Sunday morning, Jan. 26. The case is defined by a large area gouge about 7 inch wide and about 30 inch long with sloped sides like a crater, and reaching down to the densified layer of the TPS.

SUMMARY: Though this case predicted some higher temperatures at the outer layer of the honeycomb aluminum face sheet and subsequent debonding of the sheet, there is no predicted burn-through of the door, no breeching of the thermal and gas seals, nor is there door structural deformation or thermal warpage to open the seal to hot plasma intrusion. Though degradation of the TPS and door structure is likely (if the impact occurred here), there is no safety of flight (entry, descent, landing) issue.

Note to Don M. and Fred O.: On Friday I believe the MER was thoroughly briefed and it was clear that open work remained (viz., the case summarized above), the message of open work was not clearly given, in my opinion, to Linda Ham at the MMT. I believe we left her the impression that engineering assessments and cases were all finished and we could state with finality no safety of flight issues or questions remaining. This very serious case could not be ruled out and it was a very good thing we carried it through to a finish.

Rodney Rocha (ES2) x38889

- **Division Shuttle Chief Engineer (DCE), ES-Structural Engineering Division**
- **Chair, Space Shuttle Loads & Dynamics Panel**

Michele Lewis

From: SHACK, PAUL E. (JSC-EA42) (NASA)
Sent: Tuesday, January 21, 2003 10:56 AM
To: SHACK, PAUL E. (JSC-EA42) (NASA); ROCHA, ALAN R. (RODNEY) (JSC-ES2) (NASA); SERIALE-GRUSH, JOYCE M. (JSC-EA) (NASA)
Cc: KRAMER, JULIE A. (JSC-EA4) (NASA); MILLER, GLENN J. (JSC-EA) (NASA); RICKMAN, STEVEN L. (JSC-ES3) (NASA); MADDEN, CHRISTOPHER B. (CHRIS) (JSC-ES3) (NASA)
Subject: RE: STS-107 Debris Analysis Team Plans

Somebody else had the same recollection. Here's the ET FRR charts:

-----Original Message-----

From: SHACK, PAUL E. (JSC-EA42) (NASA)
Sent: Tuesday, January 21, 2003 9:33 AM
To: ROCHA, ALAN R. (RODNEY) (JSC-ES2) (NASA); SERIALE-GRUSH, JOYCE M. (JSC-EA) (NASA)
Cc: KRAMER, JULIE A. (JSC-EA4) (NASA); MILLER, GLENN J. (JSC-EA) (NASA); RICKMAN, STEVEN L. (JSC-ES3) (NASA); MADDEN, CHRISTOPHER B. (CHRIS) (JSC-ES3) (NASA)
Subject: RE: STS-107 Debris Analysis Team Plans

This reminded me that at the STS-113 FRR the ET Project reported on foam loss from the Bipod Ramp during STS-112. The foam (estimated 4X5X12 inches) impacted the ET Attach Ring and dented an SRB electronics box cover.

Their charts stated "ET TPS foam loss over the life of the Shuttle program has never been a 'Safety of Flight' issue". They were severely wirebrushed over this and Brian O'Conner (Associate Administrator for Safety) asked for a hazard assessment for loss of foam.

The suspected cause for foam loss is trapped air pockets which expand due to altitude and aerothermal heating.

-----Original Message-----

From: ROCHA, ALAN R. (RODNEY) (JSC-ES2) (NASA)
Sent: Monday, January 20, 2003 8:47 PM
To: SHACK, PAUL E. (JSC-EA42) (NASA); SERIALE-GRUSH, JOYCE M. (JSC-EA) (NASA)
Cc: KRAMER, JULIE A. (JSC-EA4) (NASA); MILLER, GLENN J. (JSC-EA) (NASA); RICKMAN, STEVEN L. (JSC-ES3) (NASA); MADDEN, CHRISTOPHER B. (CHRIS) (JSC-ES3) (NASA)
Subject: FW: STS-107 Debris Analysis Team Plans

FYI on forthcoming activity. From USA/Pam Madera and her talking to Boeing contacts:

- It appears that the image folks can only state the impactor is 20 inch max dimension plus/minus 10 inch. It has a max thickness of about 4 inch or so due to the known thicknesses of the ET insulation in the forward bipod area.
- Boeing Load/Stress group is researching if such insulation impacts are in the data base of previous impact tests on Orbiter TPS.

Rodney Rocha

- Division Chief Engineer (DCE), ES-Structural Engineering Division

-----Original Message-----

From: Dunham, Michael J [mailto:Michael.J.Dunham@boeing.com]
Sent: Thursday, January 23, 2003 8:36 PM
To: EXT-Madera, Pamela L; EXT-White, Doug; Alvin Beckner-Jr (E-mail); Bo Bejmuk (E-mail); David Camp (E-mail); Douglas Cline (E-mail); Ed Alexander (E-mail); Frances Ferris (E-mail); Garland Parlier (E-mail); John Mulholland (E-mail); Mark Pickens (E-mail); Michael Burghardt (E-mail); Mike Fuller (E-mail); Norm Beougher (E-mail); Scott Christensen V (E-mail); Steve Harrison (E-mail)
Subject: STS-107 Debris Briefing for MMT

<<Debris.ppt>>

Michael J. Dunham
Boeing/Orbiter SSM - Stress, Loads and Dynamics
(281)-853-1697
(281)-853-1525 (Fax)

Pam Madera

Vehicle and Systems Analysis Subsystem Area Manager
Phone: 281-282-4453

-----Original Message-----

From: Madera, Pamela L

Sent: Monday, January 20, 2003 5:47 PM

To: CURRY, DONALD M; ROCHA, ALAN RODNEY; LEVY, VINCENT M; KOWAL, T JOHN; DERRY, STEPHEN M

Cc: 'Scott Christensen V (E-mail)'; 'Norman Ignacio (Nacho) (E-mail)'; CHAO, DENNIS; Stoner-1, Michael D; 'Carlos Ortiz (E-mail)'; 'Michael J Dunham (E-mail)'; Sebesta, Stephen P; CORONADO, DIANA; "Craig Madden" (E-mail); Bell, Dan R.; Gordon, Michael P.; Paul A Parker (E-mail)

Subject: STS-107 Debris Analysis Team Plans

The Boeing/USA team would like to meet with you Tuesday at 2:00 on meet-me-line number
to discuss analysis plans for assessing the STS-107 Debris Impact.

Pam Madera

Vehicle and Systems Analysis Subsystem Area Manager
Phone: 281-282-4453

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Subject: FW: STS-107 Debris Analysis Team Plans

FYI on forthcoming activity. From USA/Pam Madera and her talking to Boeing contacts:

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Rodney Rocha

- **Division Chief Engineer (DCE), ES-Structural Engineering Division**
- **Chair, Space Shuttle Loads & Dynamics Panel**
- **Mail Code ES2 x38889**

: Madera, Pamela L [mailto:pam.l.madera@usahq.unitedspacealliance.com]

Sent: Monday, January 20, 2003 5:47 PM

To: CURRY, DONALD M. (JSC-ES3) (NASA); ROCHA, ALAN R. (RODNEY) (JSC-ES2) (NASA); LEVY, VINCENT M. (JSC-EG) (NASA); KOWAL, T. J. (JOHN) (JSC-ES3) (NASA); DERRY, STEPHEN M. (STEVE) (JSC-EG3) (NASA)

Cc: 'Scott Christensen V (E-mail)'; 'Norman Ignacio (Nacho) (E-mail)'; CHAO, DENNIS; Stoner-1, Michael D; 'Carlos Ortiz (E-mail)'; 'Michael J Dunham (E-mail)'; Sebesta, Stephen P; CORONADO, DIANA; "Craig Madden" (E-mail); Bell, Dan R.; Gordon, Michael P.; Paul A Parker (E-mail)

Subject: STS-107 Debris Analysis Team Plans

The Boeing/USA team would like to meet with you Tuesday at 2:00 on meet-me-line number to discuss analysis plans for assessing the STS-107 Debris Impact.

Pam Madera

Vehicle and Systems Analysis Subsystem Area Manager

Phone: 281-282-4453

Michele Lewis

From: CAMPBELL, CARLISLE C., JR (JSC-ES2) (NASA)
Sent: Thursday, January 30, 2003 5:37 PM
To: SERIALE-GRUSH, JOYCE M. (JSC-EA) (NASA)
Subject: FW: STS-107 Debris Briefing for MMT

-----Original Message-----

From: ROCHA, ALAN R. (RODNEY) (JSC-ES2) (NASA)
Sent: Friday, January 24, 2003 10:32 AM
To: CAMPBELL, CARLISLE C., JR (JSC-ES2) (NASA); RICHART, JENE A. (JSC-MS2) (NASA)
Cc: MADDEN, CHRISTOPHER B. (CHRIS) (JSC-ES3) (NASA)
Subject: FW: STS-107 Debris Briefing for MMT

Here is the Orbiter thermal/stress assessment. I do not have the system integration (Carlos Ortiz/Boeing) debris trajectory analysis charts yet. Both were presented to MER team and MMT this morning. There is good potential for tile replacement and maybe local overheating of structure, but no burn-through. Though the assessment states, so far, that no safety of flight issues exist, there is open work on one more case, the MLG Door tiles. The MER team understood this open work, but in my opinion the MMT with Linda Ham did not get the full message of open work remaining.

Rodney Rocha
Structural Engineering Division (ES-SED)

- **ES Div. Chief Engineer (Space Shuttle DCE)**
- **Chair, Space Shuttle Loads & Dynamics Panel**

Mail Code ES2 Phone 281-483-8889

-----Original Message-----

From: White, Doug [mailto:Doug.White@USAHQ.UnitedSpaceAlliance.com]
Sent: Thursday, January 23, 2003 10:23 PM
To: Wilder, James; Reeves, William D; CURRY, DONALD M. (JSC-ES3) (NASA); SCHOMBURG, CALVIN (JSC-EA) (NASA); LEVY, VINCENT M. (JSC-EG) (NASA); ROCHA, ALAN R. (RODNEY) (JSC-ES2) (NASA)
Subject: FW: STS-107 Debris Briefing for MMT

Potential tile damage charts for the MMT tomorrow morning. Mike Dunham will pitch these.

Doug White
Director, Operations Requirements
281 282-2879 office
281 282-4438 fax

600 Gemini
Houston, TX 77058

"Never let the fear of striking out get in your way." -Babe Ruth

Michele Lewis

From: CAMPBELL, CARLISLE C., JR (JSC-ES2) (NASA)
Sent: Thursday, January 30, 2003 5:38 PM
To: SERIALE-GRUSH, JOYCE M. (JSC-EA) (NASA)
Subject: FW: STS-107 Debris Analysis Team Meeting

-----Original Message-----

From: ROCHA, ALAN R. (RODNEY) (JSC-ES2) (NASA)
Sent: Thursday, January 23, 2003 7:59 AM
To: SHACK, PAUL E. (JSC-EA42) (NASA); SERIALE-GRUSH, JOYCE M. (JSC-EA) (NASA); KRAMER, JULIE A. (JSC-EA4) (NASA); CAMPBELL, CARLISLE C., JR (JSC-ES2) (NASA); MILLER, GLENN J. (JSC-EA) (NASA)
Subject: FW: STS-107 Debris Analysis Team Meeting

FYI.

Rodney Rocha
Structural Engineering Division (ES-SED)

- **ES Div. Chief Engineer (Space Shuttle DCE)**
- **Chair, Space Shuttle Loads & Dynamics Panel**

Mail Code ES2 Phone 281-483-8889

-----Original Message-----

From: Madera, Pamela L [mailto:pam.l.madera@usahq.unitedspacealliance.com]
Sent: Wednesday, January 22, 2003 11:22 AM
To: CURRY, DONALD M. (JSC-ES3) (NASA); ROCHA, ALAN R. (RODNEY) (JSC-ES2) (NASA); LEVY, VINCENT M. (JSC-EG) (NASA); KOWAL, T. J. (JOHN) (JSC-ES3) (NASA); DERRY, STEPHEN M. (STEVE) (JSC-EG3) (NASA); Nagle, Scott M; Carlos Ortiz (E-mail); GOMEZ, REYNALDO J. (RAY) (JSC-EG3) (NASA); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); Jacobs, William A
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Subject: STS-107 Debris Analysis Team Meeting

Rodney Rocha has conference room 221 in JSC Building 13 available for today's 1:00 PM telecon. Located on second floor. The dial in number is the same as below. I propose the following agenda:

Review of transport analysis (Carlos Ortiz - charts attached)
Discussion of appropriate Particle Size (Ortiz, Disler, all)
Review of Flight Design Plans for Assessing Options (Bill Jacobs)
Status of Impact Damage Assessment (P. Parker)
Status of Thermal Analysis (Norm Ignacio/Dennis Chao)
Approach for stress assessment (Dunham)
Discussion on Need/Rationale for Mandatory Viewing of damage site (All)

<<STS-107 Preliminary Debris Assessment - rev2.ppt>>

Michele Lewis

From: ROCHA, ALAN R. (RODNEY) (JSC-ES2) (NASA)
Sent: Wednesday, January 22, 2003 4:13 PM
To: SHACK, PAUL E. (JSC-EA42) (NASA)
Cc: SERIALE-GRUSH, JOYCE M. (JSC-EA) (NASA); KRAMER, JULIE A. (JSC-EA4) (NASA); MILLER, GLENN J. (JSC-EA) (NASA)
Subject: FW: STS-107 Debris Analysis Team Meeting

Rodney Rocha
Structural Engineering Division (ES-SED)

- ES Div. Chief Engineer (Space Shuttle DCE)
- Chair, Space Shuttle Loads & Dynamics Panel

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Approach for stress assessment (Dunham)
Discussion on Need/Rationale for Mandatory Viewing of damage site (All)

<<STS-107 Preliminary Debris Assessment - rev2.ppt>>

Pam Madera
Vehicle and Systems Analysis Subsystem Area Manager
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Subject: STS-107 Debris Analysis Team Meeting

Rodney Rocha has conference room 221 in JSC Building 13 available for today's 1:00 PM telecon. Located on second floor. The dial in number is the same as below. I propose the following agenda:

Review of transport analysis (Carlos Ortiz - charts attached)
Discussion of appropriate Particle Size (Ortiz, Disler, all)
Review of Flight Design Plans for Assessing Options (Bill Jacobs)
Status of Impact Damage Assessment (P. Parker)
Status of Thermal Analysis (Norm Ignacio/Dennis Chao)
Approach for stress assessment (Dunham)
Discussion on Need/Rationale for Mandatory Viewing of damage site (All)

<<STS-107 Preliminary Debris Assessment - rev2.ppt>>

Pam Madera
Vehicle and Systems Analysis Subsystem Area Manager
Phone: 281-282-4453

---Original Message---

From: Madera, Pamela L

Sent: Monday, January 20, 2003 5:47 PM

To: CURRY, DONALD M; ROCHA, ALAN RODNEY; LEVY, VINCENT M; KOWAL, T JOHN; DERRY, STEPHEN M

Cc: 'Scott Christensen V (E-mail)'; 'Norman Ignacio (Nacho) (E-mail)'; CHAO, DENNIS; Stoner-1, Michael D; 'Carlos Ortiz (E-mail)'; 'Michael J Dunham (E-mail)'; Sebesta, Stephen P; CORONADO, DIANA; "Craig Madden" (E-mail); Bell, Dan R.; Gordon, Michael P.; Paul A Parker (E-mail)

Subject: STS-107 Debris Analysis Team Plans

The Boeing/USA team would like to meet with you Tuesday at 2:00 on meet-me-line number 1
to discuss analysis plans for assessing the STS-107 Debris Impact.

Pam Madera

Vehicle and Systems Analysis Subsystem Area Manager

Phone: 281-282-4453

STS-107

TWELFTH DAILY REPORT

028:12:00 G.m.t.

The STS-107 mission is progressing nominally and all Orbiter subsystems are performing satisfactorily. No Orbiter issues have been reported in the previous 24 hours. The Orbiter consumables remaining are above the levels required for completion of the planned mission.

Regarding the debris hit on the left wing last discussed in the Fourth Daily Report; systems integration personnel performed a debris trajectory analysis to estimate the debris impact conditions and locations. This analysis was performed utilizing the reported observations from the ascent video and film. It was assumed that the debris was foam from the external tank. Based on the results of the trajectory analysis, an impact analysis was performed to assess the potential damage to the tile and reinforced carbon carbon (RCC). The impact analysis indicates the potential for a large damage area to the tile. Damage to the RCC should be limited to coating only and have no mission impact. Additionally, thermal analyses were performed for different locations and damage conditions. The damage conditions included one tile missing down to the densified layer of the tile and multiple tiles missing over an area of about 7 in by 30 in. These thermal analyses indicate possible localized structural damage but no burn-through, and no safety of flight issue.

/s/ Don L. McCormack Jr. 028:12:51 Gmt

Don L. McCormack, Jr.
STS-107 Lead MER Manager

Michele Lewis

From: McDede-1, James [James.McDede-1@ksc.nasa.gov]
Sent: Tuesday, January 21, 2003 10:10 AM
To: ROE, RALPH R. (JSC-MV) (NASA); PETETE, PATRICIA (TRISH) (JSC-MV) (NASA); SERIALE-GRUSH, JOYCE M. (JSC-EA) (NASA); SHACK, PAUL E. (JSC-EA42) (NASA); James.Wilder@USAHQ.Unitedspacealliance.com; Reeves, Bill
Subject: FW: ET Briefing - STS-112 Foam Loss

Importance: High



ET Briefing.pdf

FYI -

> -----Original Message-----
> From: Cowart-1, Jon
> Sent: Tuesday, January 21, 2003 10:02 AM
> To: Alison Dinsel-1 (E-mail); Bryan Banks (E-mail); Dean Kunz
(E-mail);
> Eddie Lackey (E-mail); James McDede (E-mail); John Gurecki (E-mail);
> Robert Abbott (E-mail)
> Subject: FW: ET Briefing - STS-112 Foam Loss
> Importance: High
>
>
>

> -----Original Message-----
> From: Sheehan, Gerald
> Sent: Tuesday, January 21, 2003 9:53 AM
> To: EXT-Abner, Charlie A #KSCEMS; EXT-Herman, Robert S; Bell, Dan
R.;
> Holmes, Stephen E.; Madden, Craig J.; McCarley, Michael C.;
Mulholland,
> John P; Muhar, M M; Engle, James M.; Luecking, Robert B.
> Cc: Fuller, Mike J.; Cabe, William; Crawford, Johnny; Leonard, Wil;
> Seraphine, Alan
> Subject: FW: ET Briefing - STS-112 Foam Loss
> Importance: High
>
> All-

>just to jog my memory, I asked Kim to pull the STS-113 FRR
> briefing from ET on the last time they lost part of the bipod SLA
closeout
> (on STS-112/ET-115). FYI
> GDS
>

> -----Original Message-----
> From: Cochran, Kimberlee D.
> Sent: Tuesday, January 21, 2003 9:40 AM
> To: Sheehan, Gerald
> Subject: ET Briefing
> Importance: High
>
> <<ET Briefing.pdf>>
>

> Kim Cochran
> Technical Publications
> 321.861.4627
> 721Z-K084
>
>

SPACE SHUTTLE PROGRAM
Space Shuttle Projects Office (MSFC)
NASA Marshall Space Flight Center, Huntsville, Alabama

STS-112/ET-115 Bipod Ramp Foam Loss

Presenter	Jerry Smelser, NASA/MP31
Date	October 31, 2002

Page 3

- **Issue**

- Foam was lost on the STS-112/ET-115 -Y bipod ramp ($\approx 4" \times 5" \times 12"$) exposing the bipod housing SLA closeout

- **Background**

- ET TPS Foam loss over the life of the Shuttle Program has never been a "Safety of Flight" issue

- More than 100 External Tanks have flown with only 3 documented instances of significant foam loss on a bipod ramp

**Missing Foam on
-Y Bipod Ramp**



SPACE SHUTTLE PROGRAM
Space Shuttle Projects Office (MSFC)
NASA Marshall Space Flight Center, Huntsville, Alabama



STS-112/ET-115 Bipod Ramp Foam Loss

Presenter	Jerry Smelser, NASA/MP31
Date	October 31, 2002
Page	4

- Rationale for Flight

- Current bipod ramp closeout has not been changed since STS-54 (ET-51)
- The Orbiter has not experienced "Safety of Flight" damage from loss of foam in 112 flights (including 3 known flights with bipod ramp foam loss)
- There have been no design / process / equipment changes over the the last 60 ETs (flights)
- All ramp closeout work (including ET-115 and ET-116) was performed by experienced practitioners (all over 20 years experience each)
- Ramp foam application involves craftsmanship in the use of validated application processes
- No change in Inspection / Process control / Post application handling, etc
- Probability of loss of ramp TPS is no higher/no lower than previous flights
- ***The ET is safe to fly with no new concerns (and no added risk)***



Bipod Attach Fitting

Michele Lewis

From: SHACK, PAUL E. (JSC-EA42) (NASA)
Sent: Tuesday, January 21, 2003 6:16 PM
To: SERIALE-GRUSH, JOYCE M. (JSC-EA) (NASA)
Subject: FW: Impact Damage Reports

-----Original Message-----

From: BROWN, KENNETH L. (JSC-MV6) (NASA)
Sent: Sunday, January 19, 2003 5:26 PM
To: SHACK, PAUL E. (JSC-EA42) (NASA)
Subject: RE: Impact Damage Reports



STS-107



STS-107



STS-107 Long



JSC STS-107



STS-107



STS-107 Ice/

Launch Film ReLaunch Film Range Tracking Vinch Video ScreLaunch Video Roris Team Pre-L

-----Original Message-----

From: SHACK, PAUL E. (JSC-EA42) (NASA)
Sent: Sunday, January 19, 2003 5:22 PM
To: MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA); BROWN, KENNETH L. (JSC-MV6) (NASA)
Subject: Impact Damage Reports

If you guys have anything info on the debris impact assessment, would you please forward. Thanks

Michele Lewis

rom: Oliu-1, Armando [Armando.Oliu-1@nasa.gov]
Sent: Saturday, January 18, 2003 4:37 PM
To: Abner, Charlie; ADAMS, RANDALL W. (JSC-MA2) (NASA); 'Ayotte, William'; Blue, John B;
BROWN, KENNETH L. (JSC-MV6) (NASA); 'Buckingham, Bruce'; Bulloch-1, Steve; Bursian,
Henry; BYRNE, GREGORY J., PHD (JSC-SX) (NASA); Chitko, Pete J.; 'cookjh@thiokol.com';
DERRY, STEPHEN M. (STEVE) (JSC-EG3) (NASA); DISLER, JONATHAN M. (JON) (JSC-
SX) (LM); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); 'Eastwood Martin'; Estrada-1,
Carlos; FRICKE, ROBERT W., JR (JSC-MV) (LM); GAETJENS, WILLIAM M. (JSC-CB)
(USA); Glenn-1, Malcolm; GOMEZ, REYNALDO J. (RAY) (JSC-EG3) (NASA); 'GRP DOC
Mission Support Room'; Guidi-1, John; Hawkins, Tyrell; Herman, Robert S; Herst, Terri;
Holloway, Darrell L; 'Holmes Steve'; Huff, Joy N.; 'Jay.Sambamurthi@msfc.nasa.gov'; Jones-
1, Frank; Kelley-1, David; 'Khodadoust, Abdollah'; Kienitz, Fred; 'Kinder Gerald'; 'Koenig Lisa';
'Kopfinger, Philip A'; Lafleur, Tom C; Leggett, Kenneth D; Leinbach-1, Mike; HAM, LINDA J.
(JSC-MA2) (NASA); 'Mango, Ed'; 'McClymonds, Jack'; MCCORMACK, DONALD L. (DON)
(JSC-MV6) (NASA); Mosteller-1, Ted; Mulligan-1, Melanie; Nguyen-1, Bao; 'O'Farrell Mike';
ORTIZ-LONGO, CARLOS R., PHD (JSC-EA4) (NASA); 'Otte Neil'; 'Otto, Scott'; 'Page,
Robert'; Payne-1, Michael; 'Ramirez, Juan'; Revay, Kenneth P; 'Rieckhoff, Tom - PC';
'Rieckhoff, Tom - UNIX'; ROE, RALPH R. (JSC-MV) (NASA); SCHOMBURG, CALVIN (JSC-
EA) (NASA); 'Schricker, B.'; 'snichols@hq.nasa.gov'; Sofge, Al (NASA HQ); 'Speece, Robert';
Stevenson-1, Charlie; 'Stone, Jeff'; Tenbusch-1, Ken; Wells-1, Joel; Wilson, Thomas F.;
Rivera, Jorge; Greenwell-1, Shawn; Oliu-1, Armando; Crisafulli, Anthony; Brewer, Raymond J;
Marren, Tom; Thompson-1, Becky J.; Key, John; Lorick, Vicky K; Champagne, Lorraine C;
Kent, William T. "Tim"; Spaulding-1, Jeff; Atemus-1, Steve; Mullins, Michael B; Powell, Doug;
Cross, Donald G; Hammel-1, Donald; Stoner-1, Michael D; Greby, Mark J
Subject: STS-107 Post-Launch Film Review - Day 2



107film2.pdf



ET208.mpg



ET208Mag.mp

g

<<107film2.pdf>> <<ET208.mpg>> <<ET208Mag.mpg>>

Michele Lewis

From: Oliu-1, Armando [Armando.Oliu-1@nasa.gov]
Sent: Friday, January 17, 2003 7:08 PM
To: Abner, Charlie; ADAMS, RANDALL W. (JSC-MA2) (NASA); 'Ayotte, William'; Blue, John B; BROWN, KENNETH L. (JSC-MV6) (NASA); 'Buckingham, Bruce'; Bulloch-1, Steve; Bursian, Henry; BYRNE, GREGORY J., PHD (JSC-SX) (NASA); Chitko, Pete J.; 'cookjh@thiokol.com'; DERRY, STEPHEN M. (STEVE) (JSC-EG3) (NASA); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); 'Eastwood Martin'; Estrada-1, Carlos; FRICKE, ROBERT W., JR (JSC-MV) (LM); GAETJENS, WILLIAM M. (JSC-CB) (USA); Glenn-1, Malcolm; GOMEZ, REYNALDO J. (RAY) (JSC-EG3) (NASA); 'GRP DOC Mission Support Room'; Guidi-1, John; Hawkins, Tyrell; Herman, Robert S; Herst, Terri; Holloway, Darrell L; 'Holmes Steve'; Huff, Joy N.; 'Jay.Sambamurthi@msfc.nasa.gov'; Jones-1, Frank; Kelley-1, David; 'Khodadoust, Abdollah'; Kienitz, Fred; 'Kinder Gerald'; 'Koenig Lisa'; 'Kopfinger, Philip A'; Lafleur, Tom C; Leggett, Kenneth D; Leinbach-1, Mike; HAM, LINDA J. (JSC-MA2) (NASA); 'Mango, Ed'; 'McClymonds, Jack'; MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA); Mosteller-1, Ted; Mulligan-1, Melanie; Nguyen-1, Bao; 'O'Farrell Mike'; ORTIZ-LONGO, CARLOS R., PHD (JSC-EA4) (NASA); 'Otte Neil'; 'Otto, Scott'; 'Page, Robert'; Payne-1, Michael; 'Ramirez, Juan'; Revay, Kenneth P; 'Rieckhoff, Tom - PC'; 'Rieckhoff, Tom - UNIX'; ROE, RALPH R. (JSC-MV) (NASA); SCHOMBURG, CALVIN (JSC-EA) (NASA); 'Schricker, B.'; 'snichols@hq.nasa.gov'; Sofge, Al (NASA HQ); 'Speece, Robert'; Stevenson-1, Charlie; 'Stone, Jeff'; Tenbusch-1, Ken; Wells-1, Joel; Wilson, Thomas F.; Rivera, Jorge; Greenwell-1, Shawn; Oliu-1, Armando; Crisafulli, Anthony; Brewer, Raymond J; Marren, Tom; Thompson-1, Becky J.; Key, John; Lorick, Vicky K; Champagne, Lorraine C; Kent, William T. "Tim"; Spaulding-1, Jeff; Altemus-1, Steve; Mullins, Michael B; Powell, Doug; Cross, Donald G; Hammel-1, Donald; Stoner-1, Michael D; Greby, Mark J
Subject: STS-107 Post-Launch Film Review - Day 1



107film1.pdf



E212.mpg

Attached is the Day 1 report and an MPG of Anomaly #1.

<<107film1.pdf>> <<E212.mpg>>

Michele Lewis

From: DISLER, JONATHAN M. (JON) (JSC-SX) (LM)
Sent: Friday, January 17, 2003 1:56 PM
To: Armando Oliu (E-mail); BAHR, PATRICIA A. (PAT) (JSC-SJ) (NASA); CONTE, BARBARA A. (JSC-DM) (NASA); 'Bill Lamkin'; SWAN, BOBBIE G. (JSC-CA) (NASA); 'Brenda Eliason'; BALU, BRIAN K. (JSC-NC) (SAIC); 'Carlos Ortiz-Longo'; CLOUDT, CHRIS R. (JSC-SX) (HEI); HADFIELD, CHRIS (JSC-CB) (CSA); 'Chris Lessmann'; 'Christine Boykin'; 'Curt Larsen / MS2'; CLEMENTS, DANIEL L. (JSC-NC) (GHG); z BROWN, DAVID M. (JSC-CB) (NASA); David Moyer / MER Manager (E-mail); BRETZ, DAVID R. (JSC-SX) (HEI); David Rigby / MPS SSM (E-mail); HAYNES, DENA S. (JSC-EV) (NASA); 'Don Prevett'; MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA); 'Doug White'; 'Douglas Powell (MAF)'; MAYER, FRED F. (JSC-NC) (SAIC); 'Gail Hargrove Boeing-Houston Imagery Scrn.'; 'Greg Katnik'; 'Gregory Galbreath'; BYRNE, GREGORY J., PHD (JSC-SX) (NASA); WALTERS, JAMES B. (BRITT) (JSC-SM) (NASA); 'James Feeley' (E-mail); 'James Walters'; JIMENEZ, JAVIER J. (JSC-EB) (LM); Jeff Goodmark (E-mail); 'Jene Richart / MS2'; 'Jill Lin'; 'Jim Harder'; 'John McKee' (E-mail); 'John Ventimiglia'; DISLER, JONATHAN M. (JON) (JSC-SX) (LM); 'Jorge Rivera'; 'Julie Kramer'; Karen Alfaro (E-mail); BROWN, KENNETH L. (JSC-MV6) (NASA); CROSBY, KEVIN L. (JSC-SX) (LM); 'L Lohrli' (E-mail); 'Malcolm Glenn'; ERMINGER, MARK D. (JSC-NC) (NASA); 'Mark Erminger'; HOLDERMAN, MARK L. (JSC-MS3) (NASA); IVINS, MARSHA S. (JSC-CB) (NASA); MARTINEZ, HUGO E. (JSC-NC) (GHG); z ANDERSON, MICHAEL P. (JSC-CB) (NASA); SNYDER, MICHAEL W. (JSC-SX) (LM); 'Mike Cagle / Boeing Film Screen'; 'Mike O'farrell'; BERTSCH, P. J. (JEFF) (JSC-DM2) (NASA); Pam Madera (E-mail); DYE, PAUL F. (JSC-DA8) (NASA); PAYNE, ROBERT W. (JSC-SA13) (LM); 'Philip Kopfinger' (E-mail); Philip Peterson / Boeing Film Screen (E-mail); 'Philip Reid / Boeing Film Screen'; SAGANTI, PREMKUMAR, PHD (JSC-SF) (LM); ADAMS, RANDALL W. (JSC-MA2) (NASA); SILVESTRI, RAYMOND T. (RAY) (JSC-DM4) (NASA); z HUSBAND, RICK D. (JSC-CB) (NASA); 'Robbie Robinson'; 'Robert Page'; SCHAFER, ROBERT (JSC-SX) (LM); 'Robert Speece'; FRICKE, ROBERT W., JR (JSC-MV) (LM); Rodney Rocha / ES2 (E-mail); 'Rodney Wallace'; 'Rohit Dhawan'; 'Ronald Clayton / MS2'; 'Roy Glanville'; 'Rudy Ramon'; SA REP; 'Sara Brandenburg'; 'Scott Otto'; 'Stephen Frick / CB'; 'Steve Derry'; 'Tom Rieckhoff'; 'Tom Wilson'; 'Treith' (E-mail)

Subject: STS-107 Long Range Tracking Video Screening

JSC STS-107 Launch Screening - Long Range Tracking Videos

January 17, 2003

JSC Image Science and Analysis Group Human Exploration Science Office / SX

ANOMALY

ET204, ET208, ET212 - During ascent at approximately 81 seconds MET, a large light-colored piece of debris was seen to originate from an area near the ET/Orbiter forward attach bipod. The debris appeared to move outboard in a -Y direction, then fell aft along the left Orbiter fuselage, and struck the leading edge of the left wing. The strike appears to have occurred on or relatively close to the wing glove near the Orbiter fuselage. After striking the left wing the debris broke into a spray of white-colored particles that fell aft along the underside (-Z side) of the Orbiter left wing. The spray of particles was last seen near the LSRB exhaust plume.

Still views and a movie loop of this event are being placed on our web site for viewing at the following address:

[<http://sn-isag.jsc.nasa.gov/shuttleweb/mission_support/sts-107/launch_video/107launchvideo.shtml>](http://sn-isag.jsc.nasa.gov/shuttleweb/mission_support/sts-107/launch_video/107launchvideo.shtml)

The times of this event are as follows:

Debris first seen near ET/Orbiter forward attach: 016:15:40:21.699 UTC

Debris contacted left wing: 016:15:40:21.882 UTC

Screening of the high speed and high resolution long range tracking films that may show more detail of this event will begin on Saturday morning, January 18th.

Normal Observations Noted Included:

Vapor off the SRB stiffener rings, recirculation, SRB plume brightening, and slag debris after SRB separation.

NOTES:

The long range video tracking views had very soft focus possibly due to clouds and haze.

SRB separation occurred at approximately 016:15:41:06.558 UTC as seen on camera ET208.

Five long range tracking videos were received and screened. Timing data was received on all of the videos received except ET207.

The launch film screening will be conducted on Saturday and Sunday and a report will be sent to distribution on Monday, January 20, 2003.

Jon Disler / SX3-LM

Joe Caruana / SX3-LM

Eric Nielsen / SX3-HEI

Michele Lewis

From: DISLER, JONATHAN M. (JON) (JSC-SX) (LM)
Sent: Thursday, January 16, 2003 7:37 PM
To: Armando Oliu (E-mail); BAHR, PATRICIA A. (PAT) (JSC-SJ) (NASA); CONTE, BARBARA A. (JSC-DM) (NASA); 'Bill Lamkin'; SWAN, BOBBIE G. (JSC-CA) (NASA); 'Brenda Eliason'; BALU, BRIAN K. (JSC-NC) (SAIC); 'Carlos Ortiz-Longo'; CLOUDT, CHRIS R. (JSC-SX) (HEI); HADFIELD, CHRIS (JSC-CB) (CSA); 'Chris Lessmann'; 'Christine Boykin'; 'Curt Larsen / MS2'; CLEMENTS, DANIEL L. (JSC-NC) (GHG); z BROWN, DAVID M. (JSC-CB) (NASA); David Moyer / MER Manager (E-mail); BRETZ, DAVID R. (JSC-SX) (HEI); David Rigby / MPS SSM (E-mail); HAYNES, DENA S. (JSC-EV) (NASA); 'Don Prevett'; MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA); 'Doug White'; 'Douglas Powell (MAF)'; MAYER, FRED F. (JSC-NC) (SAIC); 'Gail Hargrove Boeing-Houston Imagery Scrn.'; 'Greg Katnik'; 'Gregory Galbreath'; BYRNE, GREGORY J., PHD (JSC-SX) (NASA); WALTERS, JAMES B. (BRITT) (JSC-SM) (NASA); 'James Feeley' (E-mail); 'James Walters'; JIMENEZ, JAVIER J. (JSC-EB) (LM); Jeff Goodmark (E-mail); 'Jene Richart / MS2'; 'Jill Lin'; 'Jim Harder'; 'John McKee' (E-mail); 'John Ventimiglia'; DISLER, JONATHAN M. (JON) (JSC-SX) (LM); 'Jorge Rivera'; 'Julie Kramer'; Karen Alfaro (E-mail); BROWN, KENNETH L. (JSC-MV6) (NASA); CROSBY, KEVIN L. (JSC-SX) (LM); 'L Lohrli' (E-mail); 'Malcolm Glenn'; ERMINGER, MARK D. (JSC-NC) (NASA); 'Mark Erminger'; HOLDERMAN, MARK L. (JSC-MS3) (NASA); IVINS, MARSHA S. (JSC-CB) (NASA); MARTINEZ, HUGO E. (JSC-NC) (GHG); z ANDERSON, MICHAEL P. (JSC-CB) (NASA); SNYDER, MICHAEL W. (JSC-SX) (LM); 'Mike Cagle / Boeing Film Screen'; 'Mike O'farrell'; BERTSCH, P. J. (JEFF) (JSC-DM2) (NASA); Pam Madera (E-mail); DYE, PAUL F. (JSC-DA8) (NASA); PAYNE, ROBERT W. (JSC-SA13) (LM); 'Philip Kopfinger' (E-mail); Philip Peterson / Boeing Film Screen (E-mail); 'Philip Reid / Boeing Film Screen'; SAGANTI, PREMKUMAR, PHD (JSC-SF) (LM); ADAMS, RANDALL W. (JSC-MA2) (NASA); SILVESTRI, RAYMOND T. (RAY) (JSC-DM4) (NASA); z HUSBAND, RICK D. (JSC-CB) (NASA); 'Robbie Robinson'; 'Robert Page'; SCHAFER, ROBERT (JSC-SX) (LM); 'Robert Speece'; FRICKE, ROBERT W., JR (JSC-MV) (LM); Rodney Rocha / ES2 (E-mail); 'Rodney Wallace'; 'Rohit Dhawan'; 'Ronald Clayton / MS2'; 'Roy Glanville'; 'Rudy Ramon'; SA REP; 'Sara Brandenburg'; 'Scott Otto'; 'Stephen Frick / CB'; 'Steve Derry'; 'Tom Rieckhoff'; 'Tom Wilson'; 'Treith' (E-mail)

Subject: JSC STS-107 Launch Video Screening Report

JSC STS-107 Launch Video Screening Report

January 16, 2003

**JSC Image Science and Analysis Group
Human Exploration Science Office / SX**

ANOMALY CANDIDATES

No potentially anomalous events were noted during the screening of the STS-107 launch videos that were received. The long range tracking videos (second engineering replays) have not been sent via satellite to JSC. When the second replays are received they will be screened and a report will be sent to distribution.

OBSERVATIONS

The following observations are not considered anomalous but are worth noting:

OTV070 - The SSME ignition appeared normal on the video views. The start times for SSME ignition as seen on the OTV070 video were:

SSME #3 15:38:55.218 UTC
SSME #2 15:38:55.371 UTC

SSME #1 15:38:55.468 UTC

The SSME Mach diamonds formed in the expected sequence (3,2,1). The times for the Mach diamond formation were:

SSME #3 15:38:56.769 UTC

SSME #2 15:38:56.835 UTC

SSME #1 15:38:57.187 UTC

(The above engine start and Mach diamond formation times will be refined using the high speed engineering films during the film screening this weekend.)

OTV051, OTV070 - A small, white-colored flash was observed on the exterior of SSME #1 after SSME ignition (15:38:57.972 UTC). This flash was probably a piece of hydrogen burn igniter contacting the engine bell and it is not considered an abnormal event.

OTV009, OTV054, OTV063 - Pieces of purge barrier material from the LH2 umbilical were seen falling aft along the -Z side of the body flap during SSME ignition (15:38:57.203 UTC).

OTV009, OTV054 - Right inboard and outboard elevon motion was apparent during liftoff. Elevon motion during liftoff is a normal event. However, the elevon motion seen on STS-107 may have been greater than that typically seen.

OTV009 - A small light-colored piece of debris, probably debris from the SRB flame duct, was seen on the east side of the launch pad (between the RSRB and the body flap as seen on the east looking OTV009 camera view) during liftoff (15:39:01.710 UTC).

OTV051 - A piece of RCS paper debris was seen falling from near the right RCS stinger between SSME #1 and SSME #3 during SSME ignition (15:38:59.308 UTC).

OTV051 - A light-colored streak or flash was seen in the SSME #1 exhaust plume after SSME ignition (15:38:59.722 UTC).

OTV009, OTV049, OTV054 - Typical of previous missions, multiple pieces of ice debris were seen falling from the ET/Orbiter umbilicals and along the -Z side of the body flap during SSME ignition through liftoff. A single piece of umbilical ice debris contacted the forward surface of the LO2 electric cable tray near the LO2 umbilical during SSME ignition (15:38:56.054 UTC). Ice debris was seen falling near the LH2 four inch recirculation line. No damage to the launch vehicle was noted.

OTV051, OTV070 - Orange vapor (possibly free burning hydrogen) was seen forward of the SSME rims during SSME ignition. Orange vapor forward of the SSME rims during SSME ignition has been seen on previous mission films and videos.

OTV061 - Frost and vapors were visible on the -Y ET GOX vent louver prior to liftoff. Frost on the ET vent louvers has been seen on previous mission videos.

OTV060, OTV071 - The GH2 vent arm retraction and latch back appeared normal on the launch video views.

OTV050, OTV051 - Ice debris was seen falling from the LH2 and LO2 TSM T-0 umbilical disconnects at liftoff.

OTV051- A piece of probable SRB flame duct debris was seen aft of the LSRB during liftoff.

KTV4A, KTV13, KTV21A - Light or orange-colored flares in the SSME exhaust plume were seen during ascent at the following times:

15:39:12.468 UTC
15:39:14.550 UTC
15:39:33.390 UTC
15:39:33.441 UTC
15:39:35.609 UTC
15:39:40.332 UTC

A large flare was seen at 15:39:37.160 UTC. Flares in the SSME exhaust plume during ascent are sometimes caused by debris contacting the SSME plume. Usually this debris is RCS paper. Flares in the SSME exhaust plume have been observed on previous mission videos.

KTV4A - A single, light-colored piece of debris was seen exiting the SRB exhaust plume during ascent prior to SRB separation. This debris was probably instafoam from the aft end of the SRBs. The debris was seen at 15:40:19.871 UTC.

Other normal events observed included:

RCS paper debris from SSME ignition through liftoff, ice / frost on SSME purge drain-line vents, ET twang, ice and vapor from the LO2 and LH2 TSM T-0 umbilicals prior to and after disconnect, acoustic waves in the exhaust cloud after liftoff, ET aft dome outgassing and charring of the ET aft dome after liftoff, vapor off the RB stiffener rings, and the roll maneuver.

Normal pad events observed were:

Hydrogen burn igniter operation, FSS and MLP deluge water activation, LH2 and LO2 TSM T-0 umbilical disconnect and retraction, LH2 TSM door closure.

NOTES:

The STS-107 launch of Columbia (OV-102) from Pad A occurred on Thursday, January 16, 2003 at 016:15:39:00.109 UTC as seen on camera OTV050. SRB separation occurred at approximately 016:15:41:06.500 UTC as seen on camera KTV4A.

On launch day, 19 videos were received and screened. The second engineering long range tracking videos were not received. The long range tracking videos will be screened upon receipt. Timing data was received on all of the videos received except KTV13.

The launch film screening will be conducted on Saturday and Sunday and a report will be sent to distribution on Monday, January 20, 2003.

Selected launch views are available for viewing at the following web address:

http://sn-isag.jsc.nasa.gov/shuttleweb/mission_support/sts-107/launch_video/107lauchvideo.shtml

Jon Disler / SX3-LM
Chris Cloudt / SX3-HEI
Joe Caruana / SX3-LM

Michele Lewis

From: Oliu-1, Armando [Armando.Oliu-1@nasa.gov]
Sent: Thursday, January 16, 2003 3:34 PM
To: Abner, Charlie; ADAMS, RANDALL W. (JSC-MA2) (NASA); 'Ayotte, William'; Blue, John B; BROWN, KENNETH L. (JSC-MV6) (NASA); 'Buckingham, Bruce'; Bulloch-1, Steve; Bursian, Henry; BYRNE, GREGORY J., PHD (JSC-SX) (NASA); Chitko, Pete J.; 'cookjh@thiokol.com'; DERRY, STEPHEN M. (STEVE) (JSC-EG3) (NASA); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); 'Eastwood Martin'; Estrada-1, Carlos; FRICKE, ROBERT W., JR (JSC-MV) (LM); GAETJENS, WILLIAM M. (JSC-CB) (USA); Glenn-1, Malcolm; GOMEZ, REYNALDO J. (RAY) (JSC-EG3) (NASA); 'GRP DOC Mission Support Room'; Guidi-1, John; Hawkins, Tyrell; Herman, Robert S; Herst, Terri; Holloway, Darrell L; 'Holmes Steve'; Huff, Joy N.; 'Jay.Sambamurthi@msfc.nasa.gov'; Jones-1, Frank; Kelley-1, David; 'Khodadoust, Abdollah'; Kienitz, Fred; 'Kinder Gerald'; 'Koenig Lisa'; 'Kopfinger, Philip A'; Lafleur, Tom C; Leggett, Kenneth D; Leinbach-1, Mike; HAM, LINDA J. (JSC-MA2) (NASA); 'Mango, Ed'; 'McClymonds, Jack'; MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA); Mosteller-1, Ted; Mulligan-1, Melanie; Nguyen-1, Bao; 'O'Farrell Mike'; ORTIZ-LONGO, CARLOS R., PHD (JSC-EA4) (NASA); 'Otte Neil'; 'Otto, Scott'; 'Page, Robert'; Payne-1, Michael; 'Ramirez, Juan'; Revay, Kenneth P; 'Rieckhoff, Tom - PC'; 'Rieckhoff, Tom - UNIX'; ROE, RALPH R. (JSC-MV) (NASA); SCHOMBURG, CALVIN (JSC-EA) (NASA); 'Schricker, B.'; 'snichols@hq.nasa.gov'; Sofge, Al (NASA HQ); 'Speece, Robert'; Stevenson-1, Charlie; 'Stone, Jeff'; Tenbusch-1, Ken; Wells-1, Joel; Wilson, Thomas F.; Rivera, Jorge; Greenwell-1, Shawn; Oliu-1, Armando; Crisafulli, Anthony; Brewer, Raymond J; Marren, Tom; Thompson-1, Becky J.; Key, John; Lorick, Vicky K; Champagne, Lorraine C; Kent, William T. "Tim"; Spaulding-1, Jeff; Altemus-1, Steve; Mullins, Michael B; Powell, Doug; Cross, Donald G
Subject: STS-107 Post-Launch Video Review and Post-Launch MLP/Pad Inspection



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107mlp.pdf

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Michele Lewis

From: Oliu-1, Armando [Armando.Oliu-1@nasa.gov]
Sent: Wednesday, January 15, 2003 1:52 PM
To: Abner, Charlie; ADAMS, RANDALL W. (JSC-MA2) (NASA); 'Atkinson, Bill C.'; 'Ayotte, William'; Blue, John B; BROWN, KENNETH L. (JSC-MV6) (NASA); 'Buckingham, Bruce'; Bulloch-1, Steve; Bursian, Henry; BYRNE, GREGORY J., PHD (JSC-SX) (NASA); Chitko, Pete J.; 'cookjh@thiokol.com'; DERRY, STEPHEN M. (STEVE) (JSC-EG3) (NASA); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); 'Eastwood Martin'; Estrada-1, Carlos; FRICKE, ROBERT W., JR (JSC-MV) (LM); GAETJENS, WILLIAM M. (JSC-CB) (USA); Glenn-1, Malcolm; GOMEZ, REYNALDO J. (RAY) (JSC-EG3) (NASA); 'GRP DOC Mission Support Room'; Guidi-1, John; Hawkins, Tyrell; Herman, Robert S; Herst, Terri; Holloway, Darrell L; 'Holmes Steve'; Huff, Joy N.; 'Jay.Sambamurthi@msfc.nasa.gov'; Jones-1, Frank; Kelley-1, David; 'Khodadoust, Abdollah'; Kienitz, Fred; 'Kinder Gerald'; 'Koenig Lisa'; 'Kopfinger, Philip A'; Lafleur, Tom C; 'Lee Michael'; Leggett, Kenneth D; Leinbach-1, Mike; HAM, LINDA J. (JSC-MA2) (NASA); 'Mango, Ed'; 'McClymonds, Jack'; MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA); Mosteller-1, Ted; 'Mulholland John'; Mulligan-1, Melanie; Nguyen-1, Bao; 'O'Farrell Mike'; ORTIZ-LONGO, CARLOS R., PHD (JSC-EA4) (NASA); 'Otte Neil'; 'Otto, Scott'; 'Page, Robert'; Payne-1, Michael; 'Ramirez, Juan'; Revay, Kenneth P; 'Rieckhoff, Tom - PC'; 'Rieckhoff, Tom - UNIX'; 'Robertson, James M.'; ROE, RALPH R. (JSC-MV) (NASA); SCHOMBURG, CALVIN (JSC-EA) (NASA); 'Schricker, B.'; 'snichols@hq.nasa.gov'; Sofge, Al (NASA HQ); 'Speece, Robert'; Stevenson-1, Charlie; 'Stone, Jeff'; Tenbusch-1, Ken; Wells-1, Joel; Wilson, Thomas F.; Rivera, Jorge; Greenwell-1, Shawn; Oliu-1, Armando; Crisafulli, Anthony; Brewer, Raymond J; Marron, Tom; Thompson-1, Becky J.; Key, John; Lorick, Vicky K; Champagne, Lorraine C; Kent, William T. "Tim"; Spaulding-1, Jeff; Altemus-1, Steve; Mullins, Michael B; Powell, Doug STS-107 Ice/Debris Team Pre-Launch Inspection

 107preLaunch.
pdf

Michele Lewis

From: Oliu-1, Armando [Armando.Oliu-1@nasa.gov]
Sent: Saturday, January 18, 2003 4:37 PM
To: Abner, Charlie; ADAMS, RANDALL W. (JSC-MA2) (NASA); 'Ayotte, William'; Blue, John B; BROWN, KENNETH L. (JSC-MV6) (NASA); 'Buckingham, Bruce'; Bulloch-1, Steve; Bursian, Henry; BYRNE, GREGORY J., PHD (JSC-SX) (NASA); Chitko, Pete J.; 'cookjh@thiokol.com'; DERRY, STEPHEN M. (STEVE) (JSC-EG3) (NASA); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); 'Eastwood Martin'; Estrada-1, Carlos; FRICKE, ROBERT W., JR (JSC-MV) (LM); GAETJENS, WILLIAM M. (JSC-CB) (USA); Glenn-1, Malcolm; GOMEZ, REYNALDO J. (RAY) (JSC-EG3) (NASA); 'GRP DOC Mission Support Room'; Guidi-1, John; Hawkins, Tyrell; Herman, Robert S; Herst, Terri; Holloway, Darrell L; 'Holmes Steve'; Huff, Joy N.; 'Jay.Sambamurthi@msfc.nasa.gov'; Jones-1, Frank; Kelley-1, David; 'Khodadoust, Abdollah'; Kienitz, Fred; 'Kinder Gerald'; 'Koenig Lisa'; 'Kopfinger, Philip A'; Lafleur, Tom C; Leggett, Kenneth D; Leinbach-1, Mike; HAM, LINDA J. (JSC-MA2) (NASA); 'Mango, Ed'; 'McClymonds, Jack'; MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA); Mosteller-1, Ted; Mulligan-1, Melanie; Nguyen-1, Bao; 'O'Farrell Mike'; ORTIZ-LONGO, CARLOS R., PHD (JSC-EA4) (NASA); 'Otte Neil'; 'Otto, Scott'; 'Page, Robert'; Payne-1, Michael; 'Ramirez, Juan'; Revay, Kenneth P; 'Rieckhoff, Tom - PC'; 'Rieckhoff, Tom - UNIX'; ROE, RALPH R. (JSC-MV) (NASA); SCHOMBURG, CALVIN (JSC-EA) (NASA); 'Schricker, B.'; 'snichols@hq.nasa.gov'; Sofge, Al (NASA HQ); 'Speece, Robert'; Stevenson-1, Charlie; 'Stone, Jeff'; Tenbusch-1, Ken; Wells-1, Joel; Wilson, Thomas F.; Rivera, Jorge; Greenwell-1, Shawn; Oliu-1, Armando; Crisafulli, Anthony; Brewer, Raymond J; Marren, Tom; Thompson-1, Becky J.; Key, John; Lorick, Vicky K; Champagne, Lorraine C; Kent, William T. "Tim"; Spaulding-1, Jeff; Altemus-1, Steve; Mullins, Michael B; Powell, Doug; Cross, Donald G; Hammel-1, Donald; Stoner-1, Michael D; Greby, Mark J
Subject: STS-107 Post-Launch Film Review - Day 2



107film2.pdf



ET208.mpg



ET208Mag.mp

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Michele Lewis

From: Oliu-1, Armando [Armando.Oliu-1@nasa.gov]
Sent: Friday, January 17, 2003 7:08 PM
To: Abner, Charlie; ADAMS, RANDALL W. (JSC-MA2) (NASA); 'Ayotte, William'; Blue, John B; BROWN, KENNETH L. (JSC-MV6) (NASA); 'Buckingham, Bruce'; Bulloch-1, Steve; Bursian, Henry; BYRNE, GREGORY J., PHD (JSC-SX) (NASA); Chitko, Pete J.; 'cookjh@thiokol.com'; DERRY, STEPHEN M. (STEVE) (JSC-EG3) (NASA); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); 'Eastwood Martin'; Estrada-1, Carlos; FRICKE, ROBERT W., JR (JSC-MV) (LM); GAETJENS, WILLIAM M. (JSC-CB) (USA); Glenn-1, Malcolm; GOMEZ, REYNALDO J. (RAY) (JSC-EG3) (NASA); 'GRP DOC Mission Support Room'; Guidi-1, John; Hawkins, Tyrell; Herman, Robert S; Herst, Terri; Holloway, Darrell L; 'Holmes Steve'; Huff, Joy N.; 'Jay.Sambamurthi@msfc.nasa.gov'; Jones-1, Frank; Kelley-1, David; 'Khodadoust, Abdollah'; Kienitz, Fred; 'Kinder Gerald'; 'Koenig Lisa'; 'Kopfinger, Philip A'; Lafleur, Tom C; Leggett, Kenneth D; Leinbach-1, Mike; HAM, LINDA J. (JSC-MA2) (NASA); 'Mango, Ed'; 'McClymonds, Jack'; MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA); Mosteller-1, Ted; Mulligan-1, Melanie; Nguyen-1, Bao; 'O'Farrell Mike'; ORTIZ-LONGO, CARLOS R., PHD (JSC-EA4) (NASA); 'Otte Neil'; 'Otto, Scott'; 'Page, Robert'; Payne-1, Michael; 'Ramirez, Juan'; Revay, Kenneth P; 'Rieckhoff, Tom - PC'; 'Rieckhoff, Tom - UNIX'; ROE, RALPH R. (JSC-MV) (NASA); SCHOMBURG, CALVIN (JSC-EA) (NASA); 'Schricker, B.'; 'snichols@hq.nasa.gov'; Sofge, Al (NASA HQ); 'Speece, Robert'; Stevenson-1, Charlie; 'Stone, Jeff'; Tenbusch-1, Ken; Wells-1, Joel; Wilson, Thomas F.; Rivera, Jorge; Greenwell-1, Shawn; Oliu-1, Armando; Crisafulli, Anthony; Brewer, Raymond J; Marren, Tom; Thompson-1, Becky J.; Key, John; Lorick, Vicky K; Champagne, Lorraine C; Kent, William T. "Tim"; Spaulding-1, Jeff; Altemus-1, Steve; Mullins, Michael B; Powell, Doug; Cross, Donald G; Hammel-1, Donald; Stoner-1, Michael D; Greby, Mark J
Subject: STS-107 Post-Launch Film Review - Day 1



107film1.pdf



E212.mpg

Attached is the Day 1 report and an MPG of Anomaly #1.

<<107film1.pdf>> <<E212.mpg>>

Michele Lewis

From: DISLER, JONATHAN M. (JON) (JSC-SX) (LM)
Sent: Friday, January 17, 2003 1:56 PM
To: Armando Oliu (E-mail); BAHR, PATRICIA A. (PAT) (JSC-SJ) (NASA); CONTE, BARBARA A. (JSC-DM) (NASA); 'Bill Lamkin'; SWAN, BOBBIE G. (JSC-CA) (NASA); 'Brenda Eliason'; BALU, BRIAN K. (JSC-NC) (SAIC); 'Carlos Ortiz-Longo'; CLOUDT, CHRIS R. (JSC-SX) (HEI); HADFIELD, CHRIS (JSC-CB) (CSA); 'Chris Lessmann'; 'Christine Boykin'; 'Curt Larsen / MS2'; CLEMENTS, DANIEL L. (JSC-NC) (GHG); z BROWN, DAVID M. (JSC-CB) (NASA); David Moyer / MER Manager (E-mail); BRETZ, DAVID R. (JSC-SX) (HEI); David Rigby / MPS SSM (E-mail); HAYNES, DENA S. (JSC-EV) (NASA); 'Don Prevett'; MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA); 'Doug White'; 'Douglas Powell (MAF)'; MAYER, FRED F. (JSC-NC) (SAIC); 'Gail Hargrove Boeing-Houston Imagery Scrn.'; 'Greg Katnik'; 'Gregory Galbreath'; BYRNE, GREGORY J., PHD (JSC-SX) (NASA); WALTERS, JAMES B. (BRITT) (JSC-SM) (NASA); 'James Feeley' (E-mail); 'James Walters'; JIMENEZ, JAVIER J. (JSC-EB) (LM); Jeff Goodmark (E-mail); 'Jene Richart / MS2'; 'Jill Lin'; 'Jim Harder'; 'John McKee' (E-mail); 'John Ventimiglia'; DISLER, JONATHAN M. (JON) (JSC-SX) (LM); 'Jorge Rivera'; Julie Kramer'; Karen Alfaro (E-mail); BROWN, KENNETH L. (JSC-MV6) (NASA); CROSBY, KEVIN L. (JSC-SX) (LM); 'L Lohrli' (E-mail); 'Malcolm Glenn'; ERMINGER, MARK D. (JSC-NC) (NASA); 'Mark Erminger'; HOLDERMAN, MARK L. (JSC-MS3) (NASA); IVINS, MARSHA S. (JSC-CB) (NASA); MARTINEZ, HUGO E. (JSC-NC) (GHG); z ANDERSON, MICHAEL P. (JSC-CB) (NASA); SNYDER, MICHAEL W. (JSC-SX) (LM); 'Mike Cagle / Boeing Film Screen'; 'Mike O'farrell'; BERTSCH, P. J. (JEFF) (JSC-DM2) (NASA); Pam Madera (E-mail); DYE, PAUL F. (JSC-DA8) (NASA); PAYNE, ROBERT W. (JSC-SA13) (LM); 'Philip Kopfinger' (E-mail); Philip Peterson / Boeing Film Screen (E-mail); 'Philip Reid / Boeing Film Screen'; SAGANTI, PREMKUMAR, PHD (JSC-SF) (LM); ADAMS, RANDALL W. (JSC-MA2) (NASA); SILVESTRI, RAYMOND T. (RAY) (JSC-DM4) (NASA); z HUSBAND, RICK D. (JSC-CB) (NASA); 'Robbie Robinson'; 'Robert Page'; SCHARF, ROBERT (JSC-SX) (LM); 'Robert Speece'; FRICKE, ROBERT W., JR (JSC-MV) (LM); Rodney Rocha / ES2 (E-mail); 'Rodney Wallace'; 'Rohit Dhawan'; 'Ronald Clayton / MS2'; 'Roy Glanville'; 'Rudy Ramon'; SA REP; 'Sara Brandenburg'; 'Scott Otto'; 'Stephen Frick / CB'; 'Steve Derry'; 'Tom Rieckhoff'; 'Tom Wilson'; 'Treith' (E-mail)

Subject: STS-107 Long Range Tracking Video Screening

JSC STS-107 Launch Screening - Long Range Tracking Videos

January 17, 2003

JSC Image Science and Analysis Group Human Exploration Science Office / SX

ANOMALY

ET204, ET208, ET212 - During ascent at approximately 81 seconds MET, a large light-colored piece of debris was seen to originate from an area near the ET/Orbiter forward attach bipod. The debris appeared to move outboard in a -Y direction, then fell aft along the left Orbiter fuselage, and struck the leading edge of the left wing. The strike appears to have occurred on or relatively close to the wing glove near the Orbiter fuselage. After striking the left wing the debris broke into a spray of white-colored particles that fell aft along the underside (-Z side) of the Orbiter left wing. The spray of particles was last seen near the LSRB exhaust plume.

Still views and a movie loop of this event are being placed on our web site for viewing at the following address:

<http://sn-isag.jsc.nasa.gov/shuttleweb/mission_support/sts-107/launch_video/107launchvideo.shtml>

The times of this event are as follows:

Debris first seen near ET/Orbiter forward attach: 016:15:40:21.699 UTC

Debris contacted left wing:

016:15:40:21.882 UTC

Screening of the high speed and high resolution long range tracking films that may show more detail of this event will begin on Saturday morning, January 18th.

Normal Observations Noted Included:

Vapor off the SRB stiffener rings, recirculation, SRB plume brightening, and slag debris after SRB separation.

NOTES:

The long range video tracking views had very soft focus possibly due to clouds and haze.

SRB separation occurred at approximately 016:15:41:06.558 UTC as seen on camera ET208.

Five long range tracking videos were received and screened. Timing data was received on all of the videos received except ET207.

The launch film screening will be conducted on Saturday and Sunday and a report will be sent to distribution on Monday, January 20, 2003.

Jon Disler / SX3-LM

Joe Caruana / SX3-LM

Eric Nielsen / SX3-HEI

Michele Lewis

From: DISLER, JONATHAN M. (JON) (JSC-SX) (LM)
Sent: Thursday, January 16, 2003 7:37 PM
To: Armando Oliu (E-mail); BAHR, PATRICIA A. (PAT) (JSC-SJ) (NASA); CONTE, BARBARA A. (JSC-DM) (NASA); 'Bill Lamkin'; SWAN, BOBBIE G. (JSC-CA) (NASA); 'Brenda Eliason'; BALU, BRIAN K. (JSC-NC) (SAIC); 'Carlos Ortiz-Longo'; CLOUDT, CHRIS R. (JSC-SX) (HEI); HADFIELD, CHRIS (JSC-CB) (CSA); 'Chris Lessmann'; 'Christine Boykin'; 'Curt Larsen / MS2'; CLEMENTS, DANIEL L. (JSC-NC) (GHG); z BROWN, DAVID M. (JSC-CB) (NASA); David Moyer / MER Manager (E-mail); BRETZ, DAVID R. (JSC-SX) (HEI); David Rigby / MPS SSM (E-mail); HAYNES, DENA S. (JSC-EV) (NASA); 'Don Prevett'; MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA); 'Doug White'; 'Douglas Powell (MAF)'; MAYER, FRED F. (JSC-NC) (SAIC); 'Gail Hargrove Boeing-Houston Imagery Scrn.'; 'Greg Katnik'; 'Gregory Galbreath'; BYRNE, GREGORY J., PHD (JSC-SX) (NASA); WALTERS, JAMES B. (BRITT) (JSC-SM) (NASA); 'James Feeley' (E-mail); 'James Walters'; JIMENEZ, JAVIER J. (JSC-EB) (LM); Jeff Goodmark (E-mail); 'Jene Richart / MS2'; 'Jill Lin'; 'Jim Harder'; 'John McKee' (E-mail); 'John Ventimiglia'; DISLER, JONATHAN M. (JON) (JSC-SX) (LM); 'Jorge Rivera'; Julie Kramer'; Karen Alfaro (E-mail); BROWN, KENNETH L. (JSC-MV6) (NASA); CROSBY, KEVIN L. (JSC-SX) (LM); 'L Lohrli' (E-mail); 'Malcolm Glenn'; ERMINGER, MARK D. (JSC-NC) (NASA); 'Mark Erminger'; HOLDERMAN, MARK L. (JSC-MS3) (NASA); IVINS, MARSHA S. (JSC-CB) (NASA); MARTINEZ, HUGO E. (JSC-NC) (GHG); z ANDERSON, MICHAEL P. (JSC-CB) (NASA); SNYDER, MICHAEL W. (JSC-SX) (LM); 'Mike Cagle / Boeing Film Screen'; 'Mike O'farrell'; BERTSCH, P. J. (JEFF) (JSC-DM2) (NASA); Pam Madera (E-mail); DYE, PAUL F. (JSC-DA8) (NASA); PAYNE, ROBERT W. (JSC-SA13) (LM); 'Philip Kopfinger' (E-mail); Philip Peterson / Boeing Film Screen (E-mail); 'Philip Reid / Boeing Film Screen'; SAGANTI, PREMKUMAR, PHD (JSC-SF) (LM); ADAMS, RANDALL W. (JSC-MA2) (NASA); SILVESTRI, RAYMOND T. (RAY) (JSC-DM4) (NASA); z HUSBAND, RICK D. (JSC-CB) (NASA); 'Robbie Robinson'; 'Robert Page'; SCHARF, ROBERT (JSC-SX) (LM); 'Robert Speece'; FRICKE, ROBERT W., JR (JSC-MV) (LM); Rodney Rocha / ES2 (E-mail); 'Rodney Wallace'; 'Rohit Dhawan'; 'Ronald Clayton / MS2'; 'Roy Glanville'; 'Rudy Ramon'; SA REP; 'Sara Brandenburg'; 'Scott Otto'; 'Stephen Frick / CB'; 'Steve Derry'; 'Tom Rieckhoff'; 'Tom Wilson'; 'Treith' (E-mail)

Subject: JSC STS-107 Launch Video Screening Report

JSC STS-107 Launch Video Screening Report

January 16, 2003

**JSC Image Science and Analysis Group
Human Exploration Science Office / SX**

ANOMALY CANDIDATES

No potentially anomalous events were noted during the screening of the STS-107 launch videos that were received. The long range tracking videos (second engineering replays) have not been sent via satellite to JSC. When the second replays are received they will be screened and a report will be sent to distribution.

OBSERVATIONS

The following observations are not considered anomalous but are worth noting:

OTV070 - The SSME ignition appeared normal on the video views. The start times for SSME ignition as seen on the OTV070 video were:

SSME #3 15:38:55.218 UTC
SSME #2 15:38:55.371 UTC

SSME #1 15:38:55.468 UTC

The SSME Mach diamonds formed in the expected sequence (3,2,1). The times for the Mach diamond formation were:

SSME #3 15:38:56.769 UTC

SSME #2 15:38:56.835 UTC

SSME #1 15:38:57.187 UTC

(The above engine start and Mach diamond formation times will be refined using the high speed engineering films during the film screening this weekend.)

OTV051, OTV070 - A small, white-colored flash was observed on the exterior of SSME #1 after SSME ignition (15:38:57.972 UTC). This flash was probably a piece of hydrogen burn igniter contacting the engine bell and it is not considered an abnormal event.

OTV009, OTV054, OTV063 - Pieces of purge barrier material from the LH2 umbilical were seen falling aft along the -Z side of the body flap during SSME ignition (15:38:57.203 UTC).

OTV009, OTV054 - Right inboard and outboard elevon motion was apparent during liftoff. Elevon motion during liftoff is a normal event. However, the elevon motion seen on STS-107 may have been greater than that typically seen.

OTV009 - A small light-colored piece of debris, probably debris from the SRB flame duct, was seen on the east side of the launch pad (between the RSRB and the body flap as seen on the east looking OTV009 camera view) during liftoff (15:39:01.710 UTC).

OTV051 - A piece of RCS paper debris was seen falling from near the right RCS stinger between SSME #1 and SSME #3 during SSME ignition (15:38:59.308 UTC).

OTV051 - A light-colored streak or flash was seen in the SSME #1 exhaust plume after SSME ignition (15:38:59.722 UTC).

OTV009, OTV049, OTV054 - Typical of previous missions, multiple pieces of ice debris were seen falling from the ET/Orbiter umbilicals and along the -Z side of the body flap during SSME ignition through liftoff. A single piece of umbilical ice debris contacted the forward surface of the LO2 electric cable tray near the LO2 umbilical during SSME ignition (15:38:56.054 UTC). Ice debris was seen falling near the LH2 four inch recirculation line. No damage to the launch vehicle was noted.

OTV051, OTV070 - Orange vapor (possibly free burning hydrogen) was seen forward of the SSME rims during SSME ignition. Orange vapor forward of the SSME rims during SSME ignition has been seen on previous mission films and videos.

OTV061 - Frost and vapors were visible on the -Y ET GOX vent louver prior to liftoff. Frost on the ET vent louvers has been seen on previous mission videos.

OTV060, OTV071 - The GH2 vent arm retraction and latch back appeared normal on the launch video views.

OTV050, OTV051 - Ice debris was seen falling from the LH2 and LO2 TSM T-0 umbilical disconnects at liftoff.

OTV051- A piece of probable SRB flame duct debris was seen aft of the LSRB during liftoff.

KTV4A, KTV13, KTV21A - Light or orange-colored flares in the SSME exhaust plume were seen during ascent at the following times:

15:39:12.468 UTC
15:39:14.550 UTC
15:39:33.390 UTC
15:39:33.441 UTC
15:39:35.609 UTC
15:39:40.332 UTC

A large flare was seen at 15:39:37.160 UTC. Flares in the SSME exhaust plume during ascent are sometimes caused by debris contacting the SSME plume. Usually this debris is RCS paper. Flares in the SSME exhaust plume have been observed on previous mission videos.

KTV4A - A single, light-colored piece of debris was seen exiting the SRB exhaust plume during ascent prior to SRB separation. This debris was probably instafoam from the aft end of the SRBs. The debris was seen at 15:40:19.871 UTC.

Other normal events observed included:

RCS paper debris from SSME ignition through liftoff, ice / frost on SSME purge drain-line vents, ET twang, ice and vapor from the LO2 and LH2 TSM T-0 umbilicals prior to and after disconnect, acoustic waves in the exhaust cloud after liftoff, ET aft dome outgassing and charring of the ET aft dome after liftoff, vapor off the RB stiffener rings, and the roll maneuver.

Normal pad events observed were:

Hydrogen burn igniter operation, FSS and MLP deluge water activation, LH2 and LO2 TSM T-0 umbilical disconnect and retraction, LH2 TSM door closure.

NOTES:

The STS-107 launch of Columbia (OV-102) from Pad A occurred on Thursday, January 16, 2003 at 016:15:39:00.109 UTC as seen on camera OTV050. SRB separation occurred at approximately 016:15:41:06.500 UTC as seen on camera KTV4A.

On launch day, 19 videos were received and screened. The second engineering long range tracking videos were not received. The long range tracking videos will be screened upon receipt. Timing data was received on all of the videos received except KTV13.

The launch film screening will be conducted on Saturday and Sunday and a report will be sent to distribution on Monday, January 20, 2003.

Selected launch views are available for viewing at the following web address:

http://sn-isag.jsc.nasa.gov/shuttleweb/mission_support/sts-107/launch_video/107launchvideo.shtml

Jon Disler / SX3-LM
Chris Cloudt / SX3-HEI
Joe Caruana / SX3-LM

Michele Lewis

From: Oliu-1, Armando [Armando.Oliu-1@nasa.gov]
Sent: Thursday, January 16, 2003 3:34 PM
To: Abner, Charlie; ADAMS, RANDALL W. (JSC-MA2) (NASA); 'Ayotte, William'; Blue, John B; BROWN, KENNETH L. (JSC-MV6) (NASA); 'Buckingham, Bruce'; Bulloch-1, Steve; Bursian, Henry; BYRNE, GREGORY J., PHD (JSC-SX) (NASA); Chitko, Pete J.; 'cookjh@thiokol.com'; DERRY, STEPHEN M. (STEVE) (JSC-EG3) (NASA); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); 'Eastwood Martin'; Estrada-1, Carlos; FRICKE, ROBERT W., JR (JSC-MV) (LM); GAETJENS, WILLIAM M. (JSC-CB) (USA); Glenn-1, Malcolm; GOMEZ, REYNALDO J. (RAY) (JSC-EG3) (NASA); 'GRP DOC Mission Support Room'; Guidi-1, John; Hawkins, Tyrell; Herman, Robert S; Herst, Terri; Holloway, Darrell L; 'Holmes Steve'; Huff, Joy N.; 'Jay.Sambamurthi@msfc.nasa.gov'; Jones-1, Frank; Kelley-1, David; 'Khodadoust, Abdollah'; Kienitz, Fred; 'Kinder Gerald'; 'Koenig Lisa'; 'Kopfinger, Philip A'; Lafleur, Tom C; Leggett, Kenneth D; Leinbach-1, Mike; HAM, LINDA J. (JSC-MA2) (NASA); 'Mango, Ed'; 'McClymonds, Jack'; MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA); Mosteller-1, Ted; Mulligan-1, Melanie; Nguyen-1, Bao; 'O'Farrell Mike'; ORTIZ-LONGO, CARLOS R., PHD (JSC-EA4) (NASA); 'Otte Neil'; 'Otto, Scott'; 'Page, Robert'; Payne-1, Michael; 'Ramirez, Juan'; Revay, Kenneth P; 'Rieckhoff, Tom - PC'; 'Rieckhoff, Tom - UNIX'; ROE, RALPH R. (JSC-MV) (NASA); SCHOMBURG, CALVIN (JSC-EA) (NASA); 'Schricker, B.'; 'snichols@hq.nasa.gov'; Sofge, Al (NASA HQ); 'Speece, Robert'; Stevenson-1, Charlie; 'Stone, Jeff'; Tenbusch-1, Ken; Wells-1, Joel; Wilson, Thomas F.; Rivera, Jorge; Greenwell-1, Shawn; Oliu-1, Armando; Crisafulli, Anthony; Brewer, Raymond J; Marren, Tom; Thompson-1, Becky J.; Key, John; Lorick, Vicky K; Champagne, Lorraine C; Kent, William T. "Tim"; Spaulding-1, Jeff; Altemus-1, Steve; Mullins, Michael B; Powell, Doug; Cross, Donald G
Subject: STS-107 Post-Launch Video Review and Post-Launch MLP/Pad Inspection

 
107video-launch.pdf 107mlp.pdf

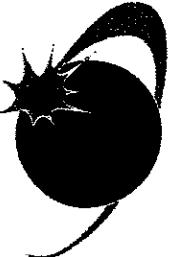
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Michele Lewis

From: Oliu-1, Armando [Armando.Oliu-1@nasa.gov]
Sent: Wednesday, January 15, 2003 1:52 PM
To: Abner, Charlie; ADAMS, RANDALL W. (JSC-MA2) (NASA); 'Atkinson, Bill C.'; 'Ayotte, William'; Blue, John B; BROWN, KENNETH L. (JSC-MV6) (NASA); 'Buckingham, Bruce'; Bulloch-1, Steve; Bursian, Henry; BYRNE, GREGORY J., PHD (JSC-SX) (NASA); Chitko, Pete J.; 'cookjh@thiokol.com'; DERRY, STEPHEN M. (STEVE) (JSC-EG3) (NASA); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); DISLER, JONATHAN M. (JON) (JSC-SX) (LM); 'Eastwood Martin'; Estrada-1, Carlos; FRICKE, ROBERT W., JR (JSC-MV) (LM); GAETJENS, WILLIAM M. (JSC-CB) (USA); Glenn-1, Malcolm; GOMEZ, REYNALDO J. (RAY) (JSC-EG3) (NASA); 'GRP DOC Mission Support Room'; Guidi-1, John; Hawkins, Tyrell; Herman, Robert S; Herst, Terri; Holloway, Darrell L; 'Holmes Steve'; Huff, Joy N.; 'Jay.Sambamurthi@msfc.nasa.gov'; Jones-1, Frank; Kelley-1, David; 'Khodadoust, Abdollah'; Kienitz, Fred; 'Kinder Gerald'; 'Koenig Lisa'; 'Kopfinger, Philip A'; Lafleur, Tom C; 'Lee Michael'; Leggett, Kenneth D; Leinbach-1, Mike; HAM, LINDA J. (JSC-MA2) (NASA); 'Mango, Ed'; 'McClymonds, Jack'; MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA); Mosteller-1, Ted; 'Mulholland John'; Mulligan-1, Melanie; Nguyen-1, Bao; 'O'Farrell Mike'; ORTIZ-LONGO, CARLOS R., PHD (JSC-EA4) (NASA); 'Otte Neil'; 'Otto, Scott'; 'Page, Robert'; Payne-1, Michael; 'Ramirez, Juan'; Revay, Kenneth P; 'Rieckhoff, Tom - PC'; 'Rieckhoff, Tom - UNIX'; 'Robertson, James M.'; ROE, RALPH R. (JSC-MV) (NASA); SCHOMBURG, CALVIN (JSC-EA) (NASA); 'Schricker, B.'; 'snichols@hq.nasa.gov'; Sofge, Al (NASA HQ); 'Speece, Robert'; Stevenson-1, Charlie; 'Stone, Jeff'; Tenbusch-1, Ken; Wells-1, Joel; Wilson, Thomas F.; Rivera, Jorge; Greenwell-1, Shawn; Oliu-1, Armando; Crisafulli, Anthony; Brewer, Raymond J; Marren, Tom; Thompson-1, Becky J.; Key, John; Lorick, Vicky K; Champagne, Lorraine C; Kent, William T. "Tim"; Spaulding-1, Jeff; Altemus-1, Steve; Mullins, Michael B; Powell, Doug
Subject: STS-107 Ice/Debris Team Pre-Launch Inspection



107preLaunch.
pdf



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STS-107 Meteoroid/Debris Risk Breakdown

Preliminary (Based on FRR ATL)

SX2/Eric L. Christiansen
LM/Jim Hyde, Tom Prior, Dana Lear

a facility of the Johnson Space Center





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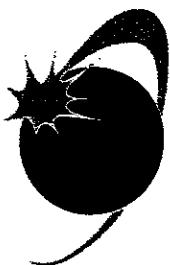
Critical Meteoroid/Debris Impact Risk

Presenter:
Eric Christiansen
Date:
February 5, 2003

- **Critical Impact risks assessed by BUMPER code**
 - Shuttle geometry model modified to determine risks for port and starboard wing zones (previously port/starboard risks combined)
 - Failure criteria and ballistic limit equations (based on hypervelocity impact data) defined for each zone of the vehicle
- **Based on FRR Attitude Timeline (ATL) critical impact risks:**

	Probability of No Critical Penetration	Odds of Critical Penetration
Overall Vehicle	0.9973	1 in 370
Port Wing only (WLE, bottom, top)	0.9996	1 in 2500
Starboard Wing only (WLE, bottom, top)	0.99958	1 in 2400





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Presenter:
Eric Christiansen

Date:
February 5, 2003

STS-107 Meteoroid & Orbital Debris Risk per Region

